

PARKING MONITORING SYSTEM WITH SECURITY SYSTEM FEATURES

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This thesis is submitted as partial fulfillment of the requirements for the award of the  
Bachelor Degree of Electrical Engineering (Electronics)

Faculty of Electrical & Electronics Engineering  
University Malaysia Pahang

MAY, 2008

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*Specially dedicated to  
My beloved family and those people who have guided and inspired me  
throughout my journey of education*

## ACKNOWLEDGEMENT

In the name of Allah S.W.T, the Most Gracious, the Ever Merciful. Praise is to Allah, Lord of the Universe and Peace and Prayers be upon His final Prophet and Messenger Muhammad s.a.w.

In preparing this thesis, I was in contact with many people, researchers, academicians and practitioners. They have contributed towards my understanding and thoughts.

In particular, I wish to express my sincere appreciation to my supervisor, Pn. Ezrinda Binti Mohd Zaihidee for encouragement, guidance, critics, friendship, advice, information and motivation. Without their continued support and interest, this thesis would not have been the same as presented here.

I am also indebted to Universiti Malaysia Pahang (UMP) for funding my degree study. Librarians at UMP also deserve special thanks for their assistance in supplying the relevant literatures and guiding me in using e-journal.

My sincere appreciation also extends to all my colleagues, ex-schoolmate and others who have provided assistance at various occasions. Their views and tips are useful indeed. Unfortunately, it is not possible to list all of them in this limited space.

Finally, special thanks extended to my beloved family who had given me moral support and prayed for my success.

Thank you.

Mohammad Faizal Bin Mohamad Ehsan

## **ABSTRACT**

To easily find an unoccupied parking space in larger car park is a problem for many drivers. During the last four-decade, there are many parking models are develop. But, the models still cannot solve the parking problem. Another problem in parking systems is about security systems. The problem is about how to make sure that the car is safe and this kind of problem involves the security systems. Thus, we have to design a system that can help driver to find parking space easily and at the same time the car that has been park is safe. This project is especially design for private parking space and this system is not suitable for open parking space. The parking space will be monitor by magnetic sensors and the security systems is applied when the user enter the password. So, the user must have a password before they can enter the parking space. Some examples of application for this system are at exclusive club, country club and any private places.

## **ABSTRAK**

Untuk mencari kawasan tempat letak kereta yang kosong bukanlah suatu pekerjaan yang mudah kepada setiap pemandu. Selama empat dekad, pelbagai modul tempat letak kereta telah direka dan diaplikasikan. Namun kesemua modul tersebut masih tidak dapat menyelesaikan masalah tersebut. Di samping itu juga terdapat beberapa masalah lain apabila kereta di letak di tempat letak kereta. Masalah tersebut adalah bagaimana untuk memastikan kereta yang diletakkan di situ selamat. Oleh yang demikian kita hendaklah membuat suatu system di mana system tersebut dapat membantu setiap pemandu mudah mencari tempat letak kereta yang kosong dan selamat. Namun begitu, projek ini hanyalah dibuat terutamanya untuk tempat letak kereta yang eksklusif dan tidak sesuai untuk tempat letak kereta yang terbuka. Salah satu contoh tempat letak kereta yang peribadi adalah kelab eksklusif, country club, dan lain-lain.

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**LIST OF ABBREVIATIONS**

<b>Component</b>	<b>The description</b>
ADC	Analog to Digital converter
CPU	Central processing unit
CCTV	Close-Circuit Television
CTS	Clear To Send
DAC	Digital to Analog converter
EPC	Electronic product code
ISR	Interrupt Service Routine
MCU	Microcontroller Unit
RF	Radio Frequency
RFID	Radio Frequency Identification
RTS	Ready to Send
OSC	Oscillation
MAC	Medium access control
RAM	Random access memory
ROM	Read only memory
WWW	World wide web
IR	Infra Red

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## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 BACKGROUND**

To easily find an unoccupied parking space in larger car park is a problem for drivers. It is because the car on the road increases every year especially in town. On the other hand, it is more difficult to find the parking space during peak time and holidays because this is the time people want to release their stress and to spend time with family. There are not many existing solutions attempting to address the problem. Thus, it is useful to have some technical solutions that can provide information on parking space occupancy [1]-[2]. The efficient parking monitoring system must be design to overcome the problem.

During the last four-decade, numerous parking search models have been developed [6]. But, the models still cannot solve the parking problem. In many decision-making situations in transportation (modal split, choice of air carrier, choice of airport, etc.) the competitive alternatives and their characteristics are reasonably well known in advance to the decision maker (passenger, driver). On the other hand, the drivers usually discover different parking alternatives one by one in a temporal sequence. Clearly, this temporal sequence has a very strong influence on the driver's final decision about the parking place [7].

Vehicle detection technology has evolved quite a bit in the last couple decades. From the air hoses to inductive loops embedded in roadways, most legacy detection methods were concentrated on getting vehicle presence information to a decision making set of control systems [1-5]. Today we want so much more information, and such information is about speed or direction of traffic, the quantity of the vehicle per time on a stretch of pavement and so on as an example.

When the driver has park their car at car parking space, there are another problem will occur. The problem is about how to make sure the car is safe and these kinds of problem involve the security systems. All drivers want to have a comfortable parking place with security when park their car. Thus, we have to design a system that can help driver to find parking space easily and at the same time the car that has been park is also safe.

The title of this project is “Parking monitoring system with Security system Features”. This project is design to overcome the problem in car parking space at private place such as Condominium, Country clubs (a club with sporting and social facilities), exclusive club and so on. It is because this place is privacy and need more security compare to the public parking space.

Generally, the system will consist of several electronic components such as magnetic field sensors, a microcontroller, servo motor, the gate itself, and sensor. Nowadays, there are so many sensors in the market. From the report of “sensor market 2008”, there are about ten most popular sensors develop today. The sensors are Temperature sensors, Pressure sensors, Flow sensors, Binary position sensors (proximity switches, light barriers), Position sensor, Chemical sensors for measurement in liquids, Level sensors, Speed sensors, Chemical sensors for measurement in gasses, Flue gas and Fire detectors sensors.

Magnetic field sensors will use in this project and it is a main part of the parking monitoring system. Another element consist in this system is about security system. The magnetic field sensor is choose because this sensor has more reliability and can be apply at many fields. Even this sensor is still new, it become more popular form a day to another because of it application. For the example, it can be



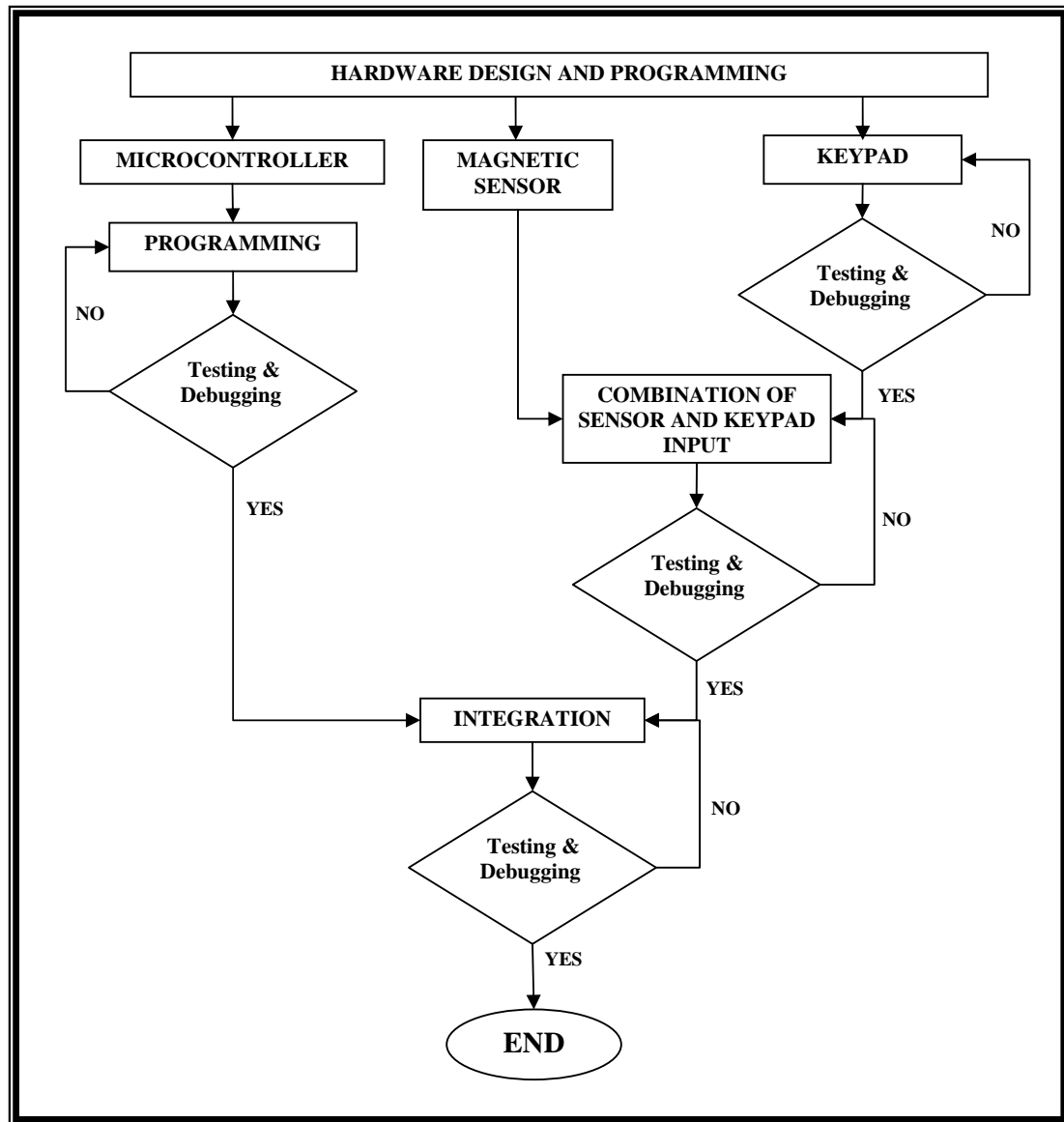
applied at Automatic Door/gate opening, Railroad Crossing Control (for trains), Parking Meters, Drive through retail (Banking, Fast-Food, etc.) and so on.

Magnetic field sensor will be attached with microcontroller as brain of this system. The sensor is design to detect the car at the car park and sent the data to the microcontroller. All the flow of the system will be completely control by microcontroller. An excellent programming is needed to be programmed into microcontroller in order to identify and monitor the car parking space before someone is given to enter the car park.

For the security system features in this project, it will design only for basic security. It is means that, the user only have to put or key in their password and the gate will open. If the password is wrong, then the gate will remain close.

This final project is divided into 3 main sections:-

- (1) Electronic design consists of Microcontroller design integrated with Magnetic Field sensors.
- (2) Develop Software to detect the vehicle at car park and at the gate. Besides that develop basic program of security system.
- (3) Mechanical design consists of gate model and motor to control the open and closed gate.



**Figure 1.0:** Product Flow for the whole project

## **1.2 OBJECTIVES**

### **1.2.1 To explore the function of Magnetic Field Sensor**

This sensor is still new in the market and it doesn't include in syllabus. A deep understanding about Magnetic Sensor is needed before this sensor technology can be applied into any system.

### **1.2.2 To develop a model of Parking Monitoring System with Security System Features**

The main objective is to develop Parking Monitoring System using Magnetic Field sensors. In this project, the sensor will be attached to a microcontroller. Everything regarding of this system such as flow of system and etc is controlled totally by microcontroller. A model of parking system will be build integrated with microcontroller and Magnetic Field Sensor.

### **1.3 PROJECT SCOPE**

The main goal of this project is develop a parking monitoring system using Magnetic Field sensor technology. There is 2 scope will be cover in this project. Firstly is to use appropriate Magnetic Sensor for this application. Secondly is to design a model of parking monitoring system using microcontroller combined with sensor and keypad include to the system.

#### **1.3.1 Use appropriate Magnetic field sensor**

There is lots of sensor in the market. Not only brand, but also the applications of the sensor itself need to be considered. This sensor will then interface with microcontroller and the result will display at the LCD Display. The LCD then shows the result of parking space available.

#### **1.3.2 Develop a model of Parking Monitoring system by using Magnetic field sensor with Security system features**

Because this system will be applied at entrance of building or area, a model of car park with monitoring system and entrance gate will be build. In general, when a person key in the password, the magnetic field sensor will send the data to microcontroller then the data will be processes either access will be given or not to the owner of the password. If yes, the gate will automatically open and at the same time the LCD will display an unoccupied parking space. If the parking lot is full, the gate will not open. Besides that, if the password is wrong, the gate will remain closed.

## **1.4 THESIS OVERVIEW**

This “Parking monitoring system with security system features” final thesis is a combination of 6 chapters that contains and elaborates specific topics such as the Introduction, Literature Review, Hardware Design, Software Development, Result, Discussion, Conclusion and Further Development that can be applied in this project.

Chapter 1 basically is an introduction of the project. In this chapter, the discussion is all about the background and objectives of the project. The overall overview of the entire project also will be discussed in this chapter.

Chapter 2 will be discussed about the literature review for the development of the Parking monitoring system with security system features. Everything related to the project will be describe generally in this chapter

Chapter 3 will be focused on hardware design of the Parking Monitoring System. This chapter included six subtopics. The entire hardware used in this project will be discussed briefly including wired connection for each part.

Chapter 4 will be discussed about the software development of the microcontroller. In this section, all basic programming will be explained through flow chart with a sample programming.

Chapter 5 discusses all the results obtained and discussion of the project. The main flow chart for this project will be explained briefly under this topic.

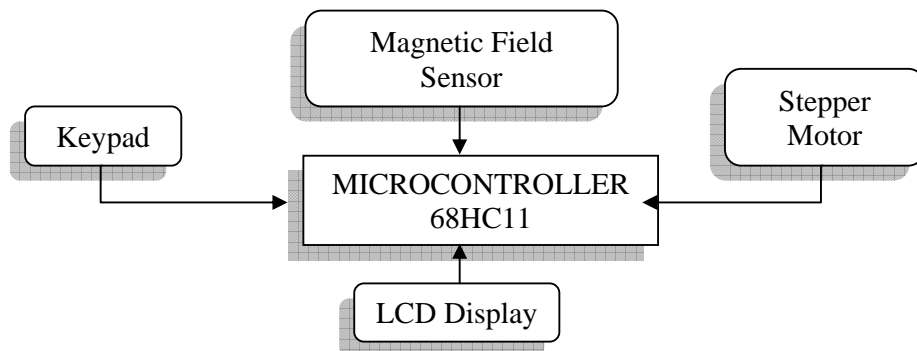
Chapter 6 discusses the conclusion and further development of the project. This chapter also discusses about total costing involved and potential of this project for commercialization.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.0 INTRODUCTION

Parking Monitoring System with Security System Features is design especially for private places. The main part of this project is sensor. It is about how to manipulate Magnetic field sensors as an indicator to detect the car in the parking monitoring system. This system consists of three modules which are **Sensors module**, **Electronic module** and **Software module**. All the modules will be combining together and build this system full functioning. Each module carries own functioning and special features which will be discussed in detail in this chapter. Figure 2.0 show overall of the system.



**Figure 2.0:** Overall System of Parking Monitoring System with Security System Features.

## 2.1 SENSOR MODULE

### 2.1.1 Sensors Overview

Today's cities are increasingly congested by cars. In average, a considerable part of a drive is spent by searching for an unoccupied parking space. The impact on environment, living quality and national economy is considerable since fuel is consumed, exhaust gas is produced and time is spent unnecessarily [1]-[5].

Finding an unoccupied parking space in the maze of a downtown area often works on a trial-and-error basis. Time needed and distance to drive could be significantly reduced if drivers were directed to an unoccupied parking space. First system indicating the remaining capacities of car parks are operational and there are visions of on board navigation systems guiding the driver to the next unoccupied parking space [1], [3].

All those systems require reliable information about occupancy situation in car parks. Currently there are two common approaches to detect whether there are unoccupied parking spaces: inductive loops and ultrasonic sensors [2], [3], [6]. Parking is the act of stopping a vehicle and leaving it unoccupied for more than a brief time. It is against the law virtually everywhere to park a vehicle in the middle of a highway or road; parking on one or both sides of a road, however, is commonly permitted. Parking facilities are constructed in combination with most buildings, to facilitate the coming and going of the buildings' users.

There is no specific solution to the parking space problem. Every problem should have the different method to solve. The more popular systems in place today are the pre-trip parking, lot-specific parking, aisle-specific parking, and reservation parking. Pre-trip parking consists of using maps of a certain area before arrival to learn where available parking is located. Lot-specific parking information system uses sensors which relay information to a main board/map that shows which parts of the parking lot are open. The aisle-specific parking is very much like the lot-specific parking except that it is used for parking garages. Lastly is the parking reservation

system, which allows customers to pre-rent a parking spot before they arrive to save time (“APMS- What Are They”) [8].

Furthermore, nowadays, an efficient parking system is important for business man. In addition most “Business is continually striving to upgrade their service and increase their return on investment. It is therefore not surprising that the quality or parking lots is increasing in importance”. In order for a business such as a mall to maximize revenue and profits, it is vital that the parking lot be efficient for shoppers because a business with “in efficient parking facilities could lose hundreds of thousands of proud in retail business every year” [8].

Today, inductive loops prevail in detecting moving traffic. An alternating magnetic field is applied, which is affected by the conductivity of metallic objects. The change of the Impedance of the loop is evaluated and used for the detection of a vehicle. Since this technique requires a moving vehicle, the occupancy status of a parking space cannot be observed directly. Instead, the number of cars in a car park, or in a section of it, is determined by monitoring the entrance and exit lanes. The durability, the considerable installation effort and the energy consumption are further major drawbacks in the employment of inductive loops [1], [6].

A sensor is a type of transducer. Direct-indicating sensors, for example, a mercury thermometer, are human-readable. Other sensors must be paired with an indicator or display, for instance a thermocouple. Most sensors are electrical or electronic, although other types exist. Sensor will be use to monitor the parking space whether it is free or full. There are many types of sensor nowadays. For the example magnetic field sensor, thermal sensor, electromagnetic sensor, optical sensor and so on.

Ultrasonic sensors are capable of determining whether a specific parking space is occupied or not. Since they need a direct line-of-sight to the parked car or to the empty parking pace and are hard to protect against dust, accidental damage or vandalism, the only feasible position for those sensors is the ceiling directly above the area to be monitored. Thus, ultrasonic sensors can only be used in multi-story car